SUPPLIER SELECTION BASED ON FUZZY DEMATEL AND FUZZY TOPSIS

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Dedicated to my beloved parents who have been a great source of motivation, inspiration and endless patience and encouragement when it was not required.

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ABSTRACT

Recent change in the industry focus towards supply chain profitability improvement has made the field of supply chain management very attractive for the researchers. Supply chain is a complex network transferring material, information and funds across number of linked entities. The organizations are required to take significant number of strategic, tactical and operational decisions at various stages of supply chain to increase the productivity and performance.

Supplier selection is one such crucial decision involving multiple objectives and conflicting tradeoffs. To choose most appropriate supplier, it is first required to weigh their performance on relevant set of criteria and compare them meticulously. Next, suppliers would be ranked based on taking into account of criteria's weights.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Supply chain management is one of the critical concerns in today's competitive business world. Supply chain management plays very important and critical point of view in reducing the cost of the products by concentrating on different categories of production cycle.

Selection of suppliers plays the most important role in supply chain. Short lead times and customer satisfaction by reducing the delivery time from suppliers and decrease the transport quantities to remain a company in competitive environment has been focused since the 1950s.(Dickson, 1966)

In order to reach the so-called aim, firstly, outstanding suppliers should be found, and then, hiring them for a long term to support and supply the firm. This should be one of the main goals for organizations in order to achieve an effective supply chain and increase enterprise competitive abilities.

In this study our goal is ranking six suppliers of Stam Sanat Limited Co. by using Fuzzy approach.

1.2 BACKGROUND AND RATIONAL

According to the controversial theory which has been presented by Handfield and Nichols, (1999) the idea of reducing production time and costs without compromising the products quality and improving products and services through SCM can be achieved by strategies for searching supplier selection. It is an important point for reaching globalization and competitive advantage for the organizations. By hiring suppliers as a contractor for the organization and became as a members of supply chain, it will have an extreme effect on the whole supply chain.(Chen et al., 2006) Effective vendor auditing and strategies of selecting alternatives would be impact on performance of supply chain, directly. And it will be resulted in organizational productivity and profitability. Supplier selection is a multi-criteria problem which, both tangible and intangible criteria are included. In this regard (Ebrahim et al., 2009) gathered a good review of the literature in multi-criteria decision-making.

Making trade-off between tangible and intangible criteria is a necessary point in ranking and selecting suppliers. By optimizing only one of the activities in trade-off it may have significant effect in increasing the total costs. For example one of the criteria which should be considered is transportation cost. According to the location of the supplier, full truckload rates are more economical than a cost per pallet based on less truckload shipment. However, if a full truckload of a product is ordered (to supplier) to reduce transportation costs (for manufacturer), there will be an increase in inventory holding costs which may also effect on increasing the total cost. Therefore for selecting logistical activities, system approach should be considered. This trade-offs are critical points to improve efficiency and effectiveness of supplier selection and strategies of SCM. Although the transportation, ordering, and inventory costs are significantly important for selecting and making evaluation of suppliers, only a few models are developed to analyze such decisions. Therefore, selecting an appropriate method to find out values of the decision maker (DM) is important. Most studies focused on examining the theoretical validity, concentrate on experimental comparisons on MADM methods Although several comparative studies were significant for the decision making

problems, DM cannot select the method and criteria based on those results. Despite many articles available in supplier selection, selecting the best supplier according to confliction between different criteria such as procurement cost, product quality and delivery performance made it a complex process. Choosing lower price of product or service can effect on the quality or delivery reliability. Therefore, the supplier selection is an inherently multi objective decision and eventually SCM has been recognized an important strategic tool for organization's efficiency to achieve competitive advantage.

1.3 PROBLEM STATEMENT

Multi Attribute Decision Making is one of the most popular methods in ranking alternatives. Though various methodologies have been applied to make ranking alternatives, ranking and weighting system was mostly subjective and it was not very tangible. In traditional decision making methods, ranking the alternatives were just based on decision maker's opinion with some crisp data. Furthermore, prior studies were not compatible for various types of relationships in supply chain management. In previous attempts criteria's importance degree and their relationships among each other were not identified well. Increasing the number of criteria and alternatives will make trouble for decision makers to distinguish relationships and the best ranking system for alternatives as well.

Considering these needs, this research aims at developing a method to overcome the entire so-called shortcomings. The proposed model is going to combine decision maker's opinion with MADM algorithms and Fuzzy approaches to deal with the above problem. Then by using Fuzzy approach, 0 and 1 viewpoint has been changed to degree of member ship. So that by this approach decision maker's opinion will be more realistic. By utilizing these methods the final result will be more understandable and tangible. Although many researchers have been conducted on FMADM, their efforts

have often focused on understandable weighting criteria. So that, by this approach, weights of selected criteria will be allocated more accurate and understandable.

1.4 OBJECTIVES OF STUDY

The objectives of the research are the following:

1. To identify criteria and sub criteria for selecting the suppliers.
2. To apply Fuzzy DEMATEL for weighting identified and validated criteria.
3. To apply Fuzzy TOPSIS for ranking and selecting suppliers.

1.5 SCOPE OF STUDY

The scope of this research investigation is the following:

1. The study tends to utilize fuzzy Multi Attribute Decision Making approach to deal with ranking alternatives.

2. Focusing on suppliers for machinery of front bracket Alternator of Peugeot 405's of Stam Sanat Company by using FMADM methods.

3. Using Microsoft Excel 2007 to get the results of FMADM algorithms.

1.6 SIGNIFICANCE OF FINDINGS

This thesis proposes select the best supplier for the organization so that the organization will be able to promote competitive capability and supplier performance. By identifying significant criteria, and apply fuzzy method for the defined criteria, suppliers are going to be ranked and selected. Thus, it is strongly needed to use multi attribute decision making methods to solve this multi criteria problem. In the end, by establishing proposed method, organization would be able to reduce the total cost and due date of the raw material. In addition it will have a better combination of supplier team to promote competitive capabilities.

1.7 RESEARCH ORGANIZATION

This thesis is setup around six chapters. This section briefly introduces the content of the chapters to provide an overview of the research's structure.

Chapter 1 introduces the current problems of selecting suppliers and back ground of this research. Furthermore, the main aim of doing this project is also explained. Objectives and scopes of the project are described as well.

Chapter 2 deals with the literature review in relevant area. It is divided in three parts. The literature which was more relevant identifying the criteria for selecting suppliers was explained in the first part. Second part is discussed mainly about the methods of previous authors on selecting the best supplier. Finally in third part of this chapter we will summarize and do the analysis of different methods mentioned in literature review.

Chapter 3 demonstrated the research framework of this study. Then step by step, proposed methodology is described.

Chapter 4 introduces the selected company and its products in brief and the way of collecting data for this research is also explained as well.

Chapter5 concludes with remarks on usability of methodology and presents the discussion on results.

Chapter 6 presents the summary of the entire project and the idea for future academic research.

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